TA16

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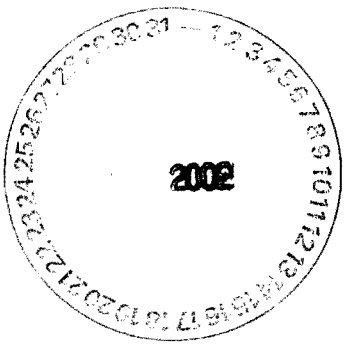
May 28, 2002



Mr. James Bearzi
Mr. David Cobrain
State of New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East
Building One
Santa Fe, New Mexico 87505-6303

Reference: Work Assignment No. Y513, 06082.350; State of New Mexico Environment Department, Santa Fe, New Mexico; Research and Permitting Support for the Los Alamos National Laboratory, Discussion and Review of Documents Describing the Application of the CALPUFF Air Dispersion Model to the TA-16 Burning Ground; Task 14 Deliverable

Dear Mr. Bearzi and Mr. Cobrain:

Enclosed please find a revision of the deliverable for the above-referenced work assignment. This deliverable was initially submitted on May 14, 2002. Based on telephone conversations and a conference call held on May 20, 2002 between NMED and TechLaw staff, additional information was provided for consideration in drafting comments. This revised deliverable remains focused on issues related to the modeling of atmospheric deposition from the open burning operations at the Technical Area 16 (TA-16) Burning Ground of the Department of Energy's Los Alamos National Laboratory, Los Alamos, New Mexico (LANL). However, it also addresses issues related to the sources of information used to estimate emissions for open burning operations at TA-16 and the screening methodology employed by LANL. The deliverable was e-mailed to Ms. Lee Winn on Tuesday, May 28, 2002, at lee_winn@nmenv.state.nm.us. The deliverable is formatted in Microsoft Word 2000.

The following information was reviewed:

- LANL's responses to previous NMED comments 1.a, 6.a, 6.b, and 6.c;
- Appendix G of the LANL Response;
- Tables 1 through 14 of the LANL Response; and
- The CALPUFF input files submitted to NMED on April 15, 2002.

In general, LANL has not provided sufficient information to determine that the air dispersion modeling and subsequent risk-based screening calculations adequately characterize the potential risks from open burn operations at TA-16. During the review, TechLaw noted deviations from expected approaches in the specification of emission factors, in the application of the CALPUFF model, and in the screening methodology employed by LANL. LANL provided little information in support of the emission factors listed in Appendix B and in the approach described in Appendix G. The attached specific comments request that LANL provide additional information so that the validity and applicability of the analyses can be determined.

Below is a summary of the results of the TechLaw review.

Responses to NMED Comments 1.a, 6.a, 6.b, and 6.c

Within the response to NMED comment 1.a, LANL identified the sources for the emission factors presented in the tables of Appendix B. While the response initially stated that emission factors for operations at LANL were taken from *Emission Factors for the Disposal of Energetic Materials by Open Burning and Open Detonation* (EPA OBOD Database), that source was used only for the burning of bulk high explosives (HE). Other sources and techniques were used for solid materials contaminated with HE and oils/solvents contaminated with HE. Chapter 8, Suggestions for Using the Database, recommended using the information in Tables 7.1 through 7.3 of Chapter 7 as a starting point and adjusting the data to fit the site-specific situation. It appears that LANL attempted to follow this suggestion. However, the information provided to support the use of alternate sources and techniques was not sufficient to determine the validity of the emission factors used by LANL. The use of alternate techniques and/or information sources should be supported by information that illustrates that the alternate methodology results in a more representative estimate of the emission factor(s). For example, comparisons of the components of the actual waste streams treated to the items covered by the EPA OBOD Database and the alternate information source should be provided. Tables comparing process parameters (e.g., burn temperature, burn time, method of ignition) should be furnished. In addition, LANL should ensure that metals for all types of open burns are addressed as suggested in the EPA OBOD Database (and as addressed by LANL in determining barium and cadmium emissions for burning bulk HE): the metals fed into the treatment process should equal the sum of the metals emitted and the metals in the ash. Specific comments on this issue as it relates to the emission factors listed in the Appendix B tables are provided in the attached document.

As part of NMED comment 6.a, LANL was asked to assess the potential risk from ash deposition to the soil. LANL did not assess the risks due to ash deposition to soil, rather, they screened modeled air concentrations and dry deposition fluxes against soil actions levels. LANL claimed that when the concentrations and fluxes were converted to equivalent soil concentrations, soil action levels were not exceeded. However, TechLaw identified some issues in the air modeling and screening methodologies employed by LANL that bring into question the results of the screening analysis.

In NMED comment 6.b, LANL was instructed to provide an analysis of the potential risk from the degradation products of HE likely to be found in the soil around the burn areas

at TA-16. LANL did not provide such an analysis, rather they cited a previous analysis performed by the NMED Air Quality Bureau and EPA report EPA/600/R-98/103 from 1998 [entitled title of the EPA report is not given, however, it is a report describing a data base of validated OB/OD emission factors taken from the Bang Box tests]. As part of the response, LANL listed the possible degradation products from the burning of HE in Table 10 of Appendix B. Table 10 also includes corresponding emission factors and annual emission estimates. The source of the emission factors was not identified so the validity of the emission estimates could not be determined.

NMED comment 6.c asked LANL to provide information on the potential quantities of volatile organic compounds released during open burning operations. LANL's response to NMED comment 6.c referred to the response for comment number 1. The response to comment number 1 was reviewed and issues related to the characterization and estimation of emissions from open burning at TA-16 remain.

The general and specific comments attached to this letter request information that should address the concerns identified during the response review.

Appendix B

While the response to NMED comment 1.a identified the sources for the emission factors provided in the tables of Appendix B, the included information was not sufficient to justify the sources used. Specific comments have been drafted asking LANL to provide additional details justifying the information sources used and, thus, the emission factors used in the screening analysis.

Appendix G

In reviewing the material presented in Appendix G, the following concerns were identified:

- LANL used the CALPUFF air dispersion model to generate deposition fluxes for use in the screening analysis. The CALPUFF model employs relatively sophisticated algorithms for calculating dry deposition flux and for estimating impacts in areas of complex terrain and complex wind fields. LANL configured the CALPUFF model to model emissions from the open burn operation as a point source (i.e., as a stack). No discussion was provided in support of this approach. LANL has been asked to justify this approach by showing that it adequately represents the actual open burning process at TA-16 and that the modeling results are conservative compared to the use of the area source algorithm in CALPUFF or other models for open burning operations.[1]

[1] TechLaw believes that LANL should have used the area source algorithm available in CALPUFF to more accurately model the source characteristics of the open burning operation. An inquiry has been sent to Earth Tech, the developers of CALPUFF, to confirm that the area source algorithm should be used when modeling open burn operations such as those at TA-16. A response has not yet been received from Earth Tech although receipt of the request has been acknowledged.

- LANL has used a default value of 0.02 meters per second (m/s) for a deposition velocity that can be applied in converting air concentrations to dry deposition fluxes. The value is referenced to two documents authored by the California Air Resources Board. For calculating dry deposition fluxes for gases, Appendix B, Table B-1-1 of EPA's *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (HHRAP) recommends a value 3 centimeters per second (0.03 m/s). The value recommended in the HHRAP should be used in lieu of the value suggested in the CARB documents. A specific comment addressing this issue is included in the attached document.

- The conversion values presented in Table 2 of Appendix G could not be reproduced. It is suggested that LANL provide a sample calculation to illustrate how these values were calculated. A specific comment to this effect is included in the attached document. The comments also note that algorithms for converting air modeling results to equivalent impacts in the soil are available in the HHRAP and that these algorithms are preferable to the method used by LANL.

- In the screening analysis, LANL used three surrogate species to represent all constituents emitted from the open burning process. The choice of the three surrogates was not adequately justified in the material submitted for review. LANL has been instructed to repeat the screening analysis considering all constituents emitted during open burning operations at TA-16 rather than a limited set of surrogates.

If you have any questions, please feel free to contact Ms. Paige Walton at (801) 451-2978.

Sincerely,

Paige Walton for

June K. Dreith
Project Manager

Enclosure
cc: Mr. John Keiling, NMED
Ms. Lee Winn, NMED
Ms. Paige Walton, TechLaw
Mr. Michael S. Smith, TechLaw
Mr. B. Jordan, TechLaw Central Files
Denver TechLaw Files

TASK 14 DELIVERABLE

DISCUSSION AND REVIEW OF THE APPLICATION OF THE CALPUFF AIR DISPERSION MODEL TO THE TECHNICAL AREA 16 BURNING GROUND AT THE DEPARTMENT OF ENERGY'S LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NEW MEXICO

General Permit Support Contract;
Research and Permitting Support for the Los Alamos National Laboratory

Submitted by:

TechLaw, Inc.
300 Union Boulevard, Suite 600
Lakewood, CO 80228

Submitted to:

Mr. David Cobrain
Mr. James Bearzi
State of New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East
Building One
Santa Fe, New Mexico 87505

In response to:

Work Assignment No. Y513, 06082.350

May 2002

Review of the Application of the CALPUFF Air Dispersion Model to the Technical Area 16 Burning Ground at the Department of Energy's Los Alamos National Laboratory Los Alamos, New Mexico

SPECIFIC COMMENTS

APPENDIX B TECHNICAL AREA 16 BURN GROUND DATA AND SUMMARY TABLES

1. Provide additional information in support of using Table 2.1-1 and Table 2.5-8 from Chapter 2 of EPA's AP-42 as the source for emission factors for the open burning of solids contaminated with high explosives (HE). The information provided should demonstrate why the emission factors from this source are preferred over those provided in the *Emission Factors for the Disposal of Energetic Materials by Open Burning and Open Detonation (OB/OD)* [EPA OBOD Database] and other sources. If metals are present in the actual waste streams flashed at TA-16, they should be addressed as recommended in the EPA OBOD Database: the amount of metal provided for treatment should equal the amount emitted plus that found in the ash.

2. Based on the information furnished in the response of the Los Alamos Nation Laboratory (LANL) to NMED comment 1.a, it is not clear that assuming a 95% efficiency for the propane burners results in the best estimates for emission factors from burning HE-contaminated oils/solvents. LANL should identify and discuss the problems specific to using the EPA OBOD Database and provide information that demonstrates that the alternate techniques and/or information sources result in the best estimates for assessing risks from the open burning of HE-contaminated oils/solvents. If metals are present in the actual waste streams flashed at TA-16, they should be addressed as recommended in the EPA OBOD Database: the amount of metal provided for treatment should equal the amount emitted plus that found in the ash.

3. It is not clear that the M31A1E1 triple-based propellant included in the EPA OBOD Database is a suitable for all bulk HE listed in Table 7 of Appendix B. Provide additional information in support of using this triple-based propellant as a surrogate. Note that some of the explosives listed in Table 7 were treated by detonation in the studies included in the EPA OBOD Database.

4. In the response to NMED comment 6.a, LANL stated that total metal concentrations (background concentrations) were divided by 20 for comparison to TCLP values for ash. The results were presented in Table 12. In Table 12, the total (background) metal concentration for chromium was divided by 276 and the concentration for mercury was divided by 10. The text should be revised to explain why chromium and mercury were treated differently.

5. For clarity, LANL should provide an example calculation illustrating how the emitted quantities of barium and cadmium listed in Table 13 were determined.

APPENDIX G DEPOSITION MODELING FOR THE TA-16 BURN GROUND

6. A better understanding of the environmental setting would be conveyed if LANL included a topographic map or plot of the modeling domain in Appendix G.

Methods

7. The first paragraph of this section states that the hand calculation performed for screening purposes assumed that deposition occurred over a circle with a radius of 1 kilometer centered on the source. No support is provided for this assumption. Revise Appendix G to show that all significant deposition from open burn operations at TA-16 occurs within a 1-kilometer (km) radius of the source. Show that the point of maximum deposition occurs within a 1 km radius of the source by including the 1 km radius circle and labeling the overall maximum impact points on Figures 1 and 2.

8. The last sentence in the first paragraph of this section states that: "This value will serve as a screening value to compare to the final results of the modeling." It is not clear what value this sentence refers to. Does the sentence refer to the value of 0.01 mg/kg or to a value calculated as described in the first paragraph? The text should be revised to clearly identify the value that will serve as a screening value. Further, the text should be revised to describe how the amount of toxic pollutant released per year that was used in calculating the screening value was determined.

9. The second paragraph states that LANL performed the air modeling analysis over a 3 km by 3 km domain. It is not clear why the modeling domain was limited to a 3 km by 3 km square rather than a larger area as suggested in EPA's HHRAP. Revise Appendix G to support the use of the 3 km by 3 km grid. Show that significant impacts did not occur at points located above the source elevation and beyond the 3 km by 3 km grid. Further, show that the maximum impact locations for all existing and potential receptor populations occurred within the modeled area.

10. In the third paragraph of this section, LANL describes how the air concentration and deposition are directly proportional to the emission rate and, thus, a unit emission rate can be used in the air modeling analysis. This information is referenced to EPA's *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities*: a document that describes dispersion modeling using the ISCST3 model. Because LANL has used the CALPUFF model in the deposition analysis of the TA-16 Burn Ground, the reference should be changed to the appropriate section of the CALPUFF User's Guide.

11. The last paragraph of this section states that PM_{10}, toluene, and NO were used to represent all the constituents emitted from open burn operations at TA-16. No support for this approach is provided. In addressing the impacts from miscellaneous units that

thermally treat waste streams (such as open burning units), it is preferred that all emitted constituents are considered rather than a limited number of surrogates. Revise the screening analysis presented in Appendix G to address all emitted constituents and to compare the resulting soil concentrations to the appropriate constituent-specific soil action levels.

Results

12. LANL has used a default value of 0.02 meters per second (m/s) for a deposition velocity that can be applied in converting air concentrations to dry deposition fluxes. The value is referenced to two documents authored by the California Air Resources Board. For calculating dry deposition fluxes for gases, Appendix B, Table B-1-1 of EPA's Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (HHRAP) recommends a value 3 centimeters per second (0.03 m/s). The value recommended in the HHRAP should be used in lieu of the value suggested in the CARB documents.

13. According to the air concentration output file, concentration.out, the overall maximum air concentration calculated by CALPUFF was 4.5×10^{-8} g/m^3, not 4.5×10^{-8} g/cm^3 as reported in the text. The typographical error should be corrected. Further, the text should be revised to indicate that this value represents an average over the entire modeled time period (i.e., an annual average) and to identify the location where it occurred in relation to the location of the burn units.

Estimating Soil Concentrations

14. For clarity, LANL should revise the text to include a sample calculation detailing how the conversion values presented in Table 2 for CALPUFF modeling results were calculated.

15. LANL stated that CALPUFF derived values for the maximum soil concentration could be compared to soil screening action levels. While identified in other sections of text, the source of the soil screening action levels is not identified in Appendix G (or in Appendix B). For clarity and transparency, revise Appendix G and Appendix B to identify the source of the soil action levels used in the screening analysis.

METEOROLOGICAL INPUT TO THE CALPUFF MODELING SYSTEM (LANL, TA-16)

16. LANL used the CALPUFF air dispersion model to generate deposition fluxes for use in the screening analysis. As noted in Appendix G, the CALPUFF model employs sophisticated algorithms for calculating dry deposition flux and for estimating impacts in areas of complex terrain and complex wind fields. In reviewing the input file, calpuff.inp, it was noted that LANL configured the CALPUFF model to model emissions from the open burn operation at TA-16 as a point source (i.e., as a stack). No discussion was provided in support of this approach. Revise Appendix G to justify the use of the CALPUFF point source algorithm in the analysis of deposition from the open burn operation at TA-16. Demonstrate that this approach adequately represents the actual

burning process (e.g., similarity in plume rise, fireball temperature) and guarantees conservative results compared to the results that would be achieved from use of CALPUFF's area source algorithm or other air dispersion models suitable for application to open burning operations (e.g., OBODM).

17. While electronic and hard copies of the CALMET and CALPUFF input files, (calmet.imp and calpuff.inp), were provided, no discussion of the input values or the settings of the flags in the input files was included. Such information is needed to determine if the input files adequately reflect conditions and open burn operations at TA-16, including the characteristics of the constituents emitted as a result of treatment. Revise the material describing the air modeling analysis to include a discussion of the input values used in both calmet.inp and calpuff.inp. In addition, describe why the input flags were set as shown in the copies of these files. For example, the description provided for calpuff.inp should address:

    - Group 2 flags;
    - Chemical parameter values from Group 7;
    - Use of the default values for the resistances in Group 9; and
    - Use of the default value specified for surface roughness in Group 12.

    Discussions of the environmental setting, surrounding land use, potential exposure pathways, and the complex wind field should also be provided in support of the modeling input values.

18. Provide electronic copies of all input and ancillary files needed to repeat the air modeling analysis performed for the TA-16 burn grounds. These should include all model-ready meteorological and terrain files.